REMARKS

The Applicant thanks the Examiner for the helpful telephone interview on April 17, 2007 in which Claims 1 and 16 were discussed in view of the cited prior art. Claims 1 and 16 have been amended in view of suggestions by the Examiner.

The Specification has been amended as requested by the Examiner. No new matter is added.

Claims 1-40 are pending in the application. In the Office Action at hand, Claims 4, 7-15 and 21-40 are withdrawn from consideration, and Claims 1-3, 5, 6 and 16-20 are rejected.

In particular, Claims 16 and 19 are rejected under 35 U.S.C. §102(b) as being anticipated by Melton. In addition, Claims 1-2, 5, 6, 17 and 18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Melton in view of JP 57152438. Also, Claims 3 and 20 are rejected under Section 103(a) as being unpatentable over Melton, JP 57152438 and Beal. Finally, Claims 1-3, 5, 6 and 16-20 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1 and 3-6 of copending Application No. 10/744,326. In response to the Section 102(b) and 103(a) rejections, and the obvious-type double patenting rejection, the Applicants respectfully submit that Claims 1, 3, 5, 6, 16-18 and 20, as amended, are not anticipated or obvious in view of Melton, JP 57152438, Beal, or unpatentable in view of Application No. 10/744,326. Reconsideration is respectfully requested.

Claim 1, as amended, recites a solder composition including an alloy having tin (Sn) and silver (Ag). A granular additive is included which is at least about 3% of the solder composition by weight. The granular additive is pretreated with flux and can be a nickel iron alloy with about 36% nickel (Ni) and about 64% iron (Fe), by weight. The granular additive is in granular form within said alloy and is wetted with the alloy by the flux. Claim 16, as amended, recites a solder composition including a granular material having a material of a low coefficient of thermal expansion.

Claims 1 and 16 have been amended to recite "an alloy comprising tin and silver", a "granular additive pretreated with flux" and "the granular additive being in granular form within said alloy and being wetted with the alloy by the flux". Support for these amendments is found at least in FIGs. 1 and 2 and on Page 6, line 21 through Page 7, line 2, of the Specification as

originally filed, which defines "pretreating". In addition, Claim 6 has been amended to correct a typographical error. No new matter is introduced.

Claims 1, 3, 5, 6, 16-18 and 20, as now amended, are patentably distinct over Claims 1 and 3-6 of copending Application No. 10/744,326, and overcome the nonstatutory obviousness-type double patenting rejection.

In the claimed invention, the use of a granular additive with a low coefficient of thermal expansion that remains in granular form within a lead free solder, such as a tin silver alloy, can allow the solder to be used for soldering to a glass substrate. Granules of the granular additive that are evenly dispersed in the solder alloy and remain in granular form can combat thermal shock to the glass substrate and can prevent the solder from separating from the glass substrate or prevent cracking of the glass substrate. However, obtaining proper mixing and an even dispersion of the granular additive (for example, formed of a nickel iron alloy), within a tin silver alloy typically cannot be obtained by merely mixing the tin, silver and granular additive together and melting, as is the common method for forming solder compositions. Mere mixing and melting of the tin, silver and granular additive can result in poor mixing and/or clumping of the granular additive, and therefore, little or uneven dispersion of the granular additive within the solder alloy. An even dispersion of the granules is desired for use with glass, since little or uneven dispersion of granular additive can result in the solder separating from or cracking the glass.

The Applicants have found that by pretreating the granular additive, for example, formed of a nickel iron alloy, with flux before mixing with a molten tin silver alloy, the granular additive can easily wet with the solder and mix in and remain in granular form in a generally evenly dispersed manner. As is pointed out further below with respect to the teachings of Beal, iron and nickel are not normally present in solder alloys, and specifications usually limit the iron and nickel content to a maximum of .02%. Beal further states that severe reductions in wetting properties have been observed with higher levels. The nickel iron level of 3% recited in Claim 1 is an amount that is 150 times greater than the .02% maximum in the prior art taught by Beal.

In contrast, Melton discloses a tin, bismuth, gold and flux paste which is melted together during reflow. All of the elements melt, so that none of the elements remain in granular form within an alloy. In addition, Melton does not disclose a tin silver solder alloy to which a granular additive is added.

Accordingly Claim 16, as amended, is not anticipated by Melton since Melton does not teach or suggest "an alloy comprising tin and silver; and a granular additive pretreated with flux and comprising a material having a low coefficient of thermal expansion and being at least about 3% of the solder composition by weight, the granular additive being in granular form in said alloy and being wetted with the alloy by the flux," as recited in Claim 16, as amended. As previously discussed, the word "pretreated" is defined at least on Page 6, line 21 through Page 7, line 2 of the Specification as originally filed. Therefore, Claim 16, as amended, is in condition for allowance. Reconsideration is respectfully requested.

JP 57152438 discloses a thermal expansion regulating material having Fe-Ni (iron nickel) alloy powder surface coated with Mo (molybdenum) or W (tungsten) that is mixed with Cu (copper) powder, and compressed and sintered. A compressed sintered product is not melted to a level that causes mixing to form an alloy. Instead the particles attach to each other to form the desired shape. In addition, the nickel iron powder is not contained within a tin silver alloy in a granular form.

Accordingly, Claims 1, 5, 6, 17 and 18, as amended, are not obvious in view of Melton and JP 57152438 since neither reference, alone or in combination, teach or suggest "an alloy comprising tin (Sn) and silver (Ag); and a granular additive which is at least about 3% of the solder composition by weight, the granular additive pretreated with flux and comprising a nickel iron alloy comprising about 36% nickel (Ni) and about 64% iron (Fe), by weight, the granular additive being in granular form within said alloy and being wetted with the alloy by the flux," as recited in base Claim 1, as amended, or "an alloy comprising tin and silver; and a granular additive pretreated with flux and comprising a material having a low coefficient of thermal expansion and being at least about 3% of the solder composition by weight, the granular additive being in granular form in said alloy and being wetted with the alloy by the flux," as recited in Claim 16, as amended. Therefore, Claims 1, 5, 6, 17 and 18, as amended, are in condition for allowance. Reconsideration is respectfully requested.

Beal discloses on Page 434 typical inorganic flux constituents, including zinc chloride, ammonium chloride and hydrochloric acid, which function well with torch, oven, resistance or induction soldering methods. Page 429 of Beal teaches that iron and nickel are not normally present in solder alloys, and specifications usually limit the iron and nickel content to a maximum of .02%. In addition, severe reductions in wetting properties have been observed with higher levels. Beal teaches against adding a nickel iron granular additive in an amount that is at

least about 3% of a tin silver alloy, and suggests that it can not be accomplished. As previously mentioned, a 3% nickel iron level is 150 times greater than .02%.

Accordingly, Claims 3 and 20 are not obvious in view of Melton, JP 57152438 and Beal, since none of the references, alone or in combination, teach or suggest "an alloy comprising tin (Sn) and silver (Ag); and a granular additive which is at least about 3% of the solder composition by weight, the granular additive pretreated with flux and comprising a nickel iron alloy comprising about 36% nickel (Ni) and about 64% iron (Fe), by weight, the granular additive being in granular form within said alloy and being wetted with the alloy by the flux," as recited in Claim 1, as amended, and "an alloy comprising tin and silver; and a granular additive pretreated with flux and comprising a material having a low coefficient of thermal expansion and being at least about 3% of the solder composition by weight, the granular additive being in granular form in said alloy and being wetted with the alloy by the flux," as recited in Claim 16, as amended. Therefore, Claims 3 and 20 are in condition for allowance. Reconsideration is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,
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